Visualization of Global suicide rates

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Lab 33

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Table of Contents

1. Introduction

With the globalization trend rising, various global data have received more attention from the public. Because the level of global suicide rate can certainly expand to reflect the stability and other characteristics of a society, therefore it has attracted the attention of groups including governments, public welfare organizations, and so on. According to a report from the US Centers for Disease Control and Prevention, suicide has been affected by many factors, it is not a simple mental health problem and requires more public attention. This topic is dedicated to studying some of the factors that affect the suicide rate, including changes in the GDP of various countries, gender, and nationality of suicides. The purpose is to study these factors, so as to obtain a certain amount of data that can be analyzed, and then visualize and analyze the data to a certain extent, try to get meaningful results, and make feasible suggestions.

First of all, the subject uses the country as the main variable, analyzes and compares the suicide rates of various countries in different years, and visualizes the results on the web page, which can help the researchers more intuitively observe the suicide rates of various countries. The changes in the suicide rate and the overall trend over time can also be visually displayed, which helps to study the suicide rate in a certain country or countries.

Next, this topic will use GDP as the main variable to study the suicide rate. The author integrates, compares, and analyzes the GDP data of various countries and the suicide rate of each year, and finally visualizes the results on the web page. The study attempts to find the potential relationship between changes in GDP and changes in the suicide rate, helping researchers to conduct a more in-depth study of suicide rates in economic terms.

In the end, the subject conducted a certain degree of research on the gender of suicides. The author believes that gender is also one of the important factors that affect the suicide rate. Therefore, the author extracts integrate and analyses the gender of suicide and visualize the overall gender ratio of suicide and the approximate gender ratio of the suicide each year. The results are also displayed on the web page, it will help to help the researchers more intuitively observe the relationship between gender and suicide rate.

The results of this research are intended to provide a tool or data analysis results which can help scholars to study suicide rate for further exploration. Besides, the author hopes that the results can provide certain research results, it can have an effect on projects and

actions which reduce the suicide rate organized by government or public welfare organizations. In this way, some minor contributions can be made to maintaining the stability of the entire society and achieving personal happiness.

The main data sources for this topic come from the official website of the World Bank (https://data.worldbanj.org/indicator/NY.GDP.MKTP.CD) and WHO (https://apps.who.int/gho/data/view.main.MHSUIDEv), retrieved tens of thousands of original data over the years.

2.Design

Sheet 1：

The design of this project is discussed from the aspects of suicide rate, GDP, gender, and the suicide rate in different countries around the world. When implementing this project, I found many graphs from the Internet for inspiration and analyzed some possible visualization methods including line graphs, bar chart pie charts, line charts, scatter plots, and so on. These inspirations gave me a good starting point to help me conceive the design afterward. After that, I quickly outlined the idea of these data visualizations and displayed them in the most effective way.

Sheet 2：

The design of the sheet 2 that I chose to use a bar chart to show the trend of suicide rate in different countries and users can choose different years to observe the changes in various countries in different years (Tabular data 1). The color of each country is indicated on the right of the bar chart. Since there are many countries around the world, the user can select a country he or she is interested in, and the chart will be changed. When a country is selected by the user, the color of the country will turn red in the bar chart, and the colors of the unselected countries will become gray or the other same colors.

Sheet 3：

In this section, I will explore the impact of GDP on the suicide rate, because I think the country's economic level may be an important factor in suicide (Tabular data 2). So, combining the data of GDP, year, and country to explore their impact on the suicide rate. Besides, I chose to use a scatter plot to show the relationship between suicide rate and GDP in various countries in different years. The size of the bubble represents the value of the suicide rate. I chose to use different color to identify countries. When the user moves the mouse over the bubble, it will display the country name and the value of the current GDP. At the same time, the user can choose different years and countries that he or she is interested in and observed the changes in the plot. When users select a country, the bar of that country will become red, and all others will become blue.

Sheet 4：

In this section, I think gender may be another factor affecting the suicide rate. I created a pie chart to explore the percentage of male and female suicide rates, when the user moves the mouse to the pie chart, it will show detailed information. I also created a scatter plot to observe the distribution of male and female suicide rates. User can identify the female and male by color in pie chart and scatter plot. In addition, users can choose specific gender and different years to observe changes in the suicide rate.

Sheet 5:

I designed navigation and put the three questions on side bar in different interfaces. Users can click different titles on the website and choose to see the graph. When the user clicks on different titles, the color of the title will change green, so that the user can be given feedback. After entering different interfaces, each graph will have an interactive function and the graph will show differently when people select an option in the select box.

3.Implementation

In the process of practice, I chose to use R shiny application which has two components, a user interface object, and a server function to complete. Because using R shiny can realize a fully automatic APP, the results will be output automatically after the user inputs, and the implementer does not need to have knowledge of HTML, CSS, or JavaScript to build an interactive application website.

In this project, the library that I used is plotly, shiny, plyr, shinythemes. I think plotly is a relatively easy-to-use package in visual interaction diagrams which is an R package for creating reactive web applications entirely in R (Chang 2017).

At the same time, plotly can be compatible with multiple languages/tools which are R, Python, MATLAB, Perl, Julia, and Arduino. In addition, the syntax of plotly is very simple, like ggplot2 in R while plotly is compatible with ggplot. The library of shinythemes can change the theme of the navigation bar on the web page which can make the web page look more professional.

This web page uses a navigation bar to place three different interfaces on the visualizations that illustrate the three issues. When the user moves the mouse to a title in the navigation bar, the words on the navigation bar will turn green and give the user an interactive function. On the left side of the website interface, users can see the research questions corresponding to each picture. At the bottom of the page, the user can click the play button and explore the changes in the graph in different years. At the same time, the user can also choose to stop on a particular year to observe the correlation.

In the actual coding, I originally wanted to use ggplot to make interactive graphs on the website, but I found that using ggplot to make an interactive graph is difficult for me to achieve, and it is difficult to implement the function which the user can click the Play button. So, I chose to use a Plotly package to achieve it.

4.User guide

1. Open the website, the first web page will be displayed in front of you, including the top navigation bar, the filter bar on the left and the data display bar on the right(Figure 1).

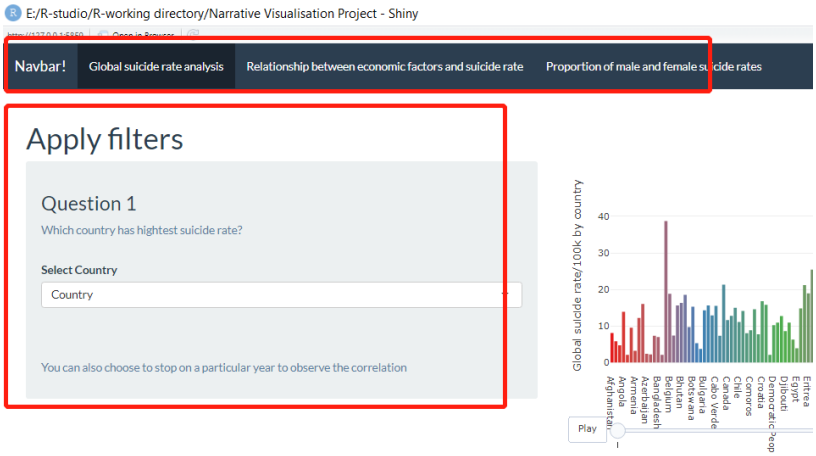


Figure 1 navigation bar + side bar

2. The first part of the navigation bar is "Navbar!" This is a reminder and cannot be clicked. On its right, there is "Global suicide rate analysis", "Relationship between economic factors and suicide rate" and "Proportion of male and female suicide rate". The first page is by default "Global suicide rate analysis". Click one of the navigation bar parts, you will be navigated to the corresponding other pages, and the corresponding navigation bar part of the page will be darker than the other parts(Figure 2).

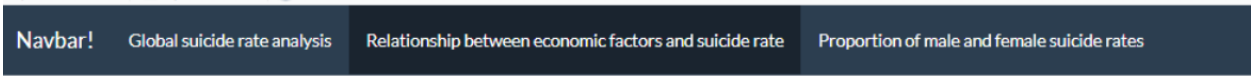


Figure 2 navigation bar

3. The left side of the first page is the filter bar "Apply filters". There is a grey box below it, showing the problem "Which country has the highest suicide rate?". There is a spinner below, by default, “Country” is selected, which means that the country on the right will display all countries. You can click spinner and select the country you want to see(Figure 3).

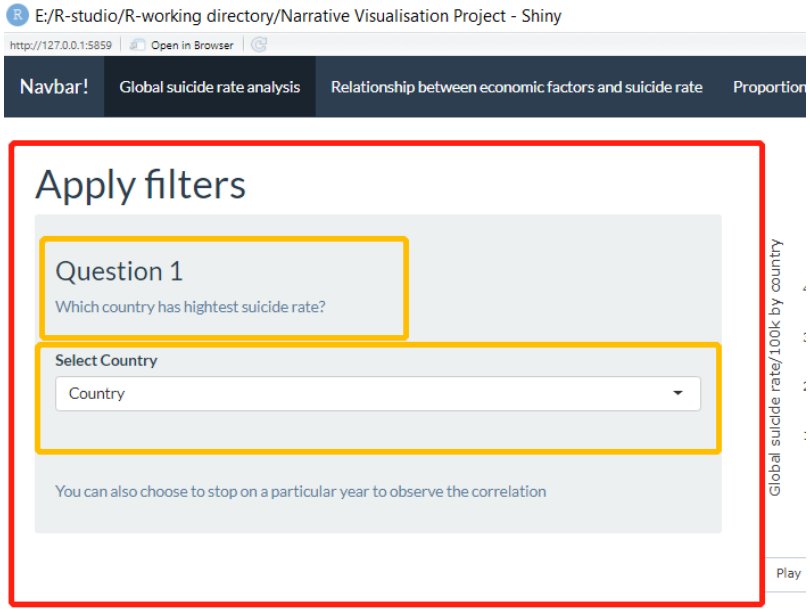


Figure 3 side bar function

4. The part on the right shows a bar chart. The X-axis is country and the Y-axis is "Global suicide rate/100k by country". The right end will display the names of all countries, arranged in the order of A to Z. The display box has a slide, you can slide it by yourself. By default, the graph will display the suicide rate data of all countries in 2000, and each country will be represented in different colors(Figure 4).

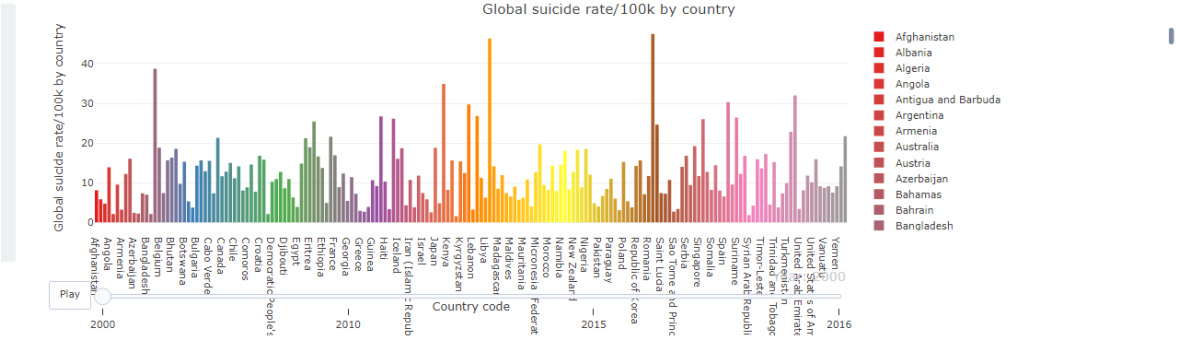


Figure 4 bar chart

5. The bar chart on the right can filter the displayed countries. The name of the country on the right can be clicked, and it will appear slightly darker in color when clicked (Figure 5).The bar chart representing the country in the figure will disappear. You can also filter through the left filter part, you can select a country, the bar of that country will become red, and all others will become blue (Figure 6).

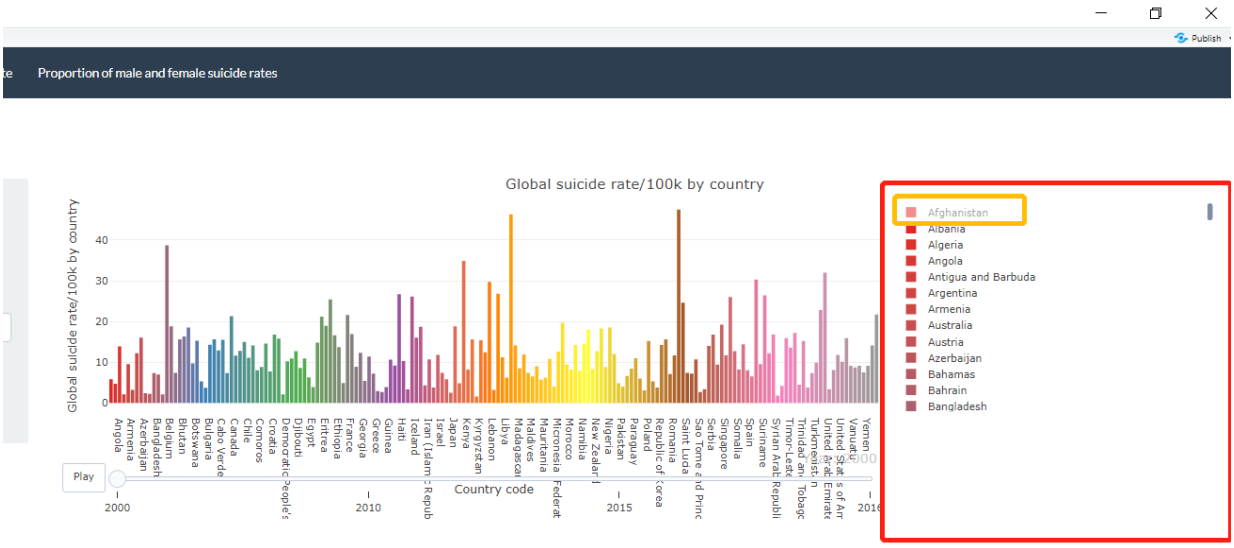


Figure 5 select country to disappear

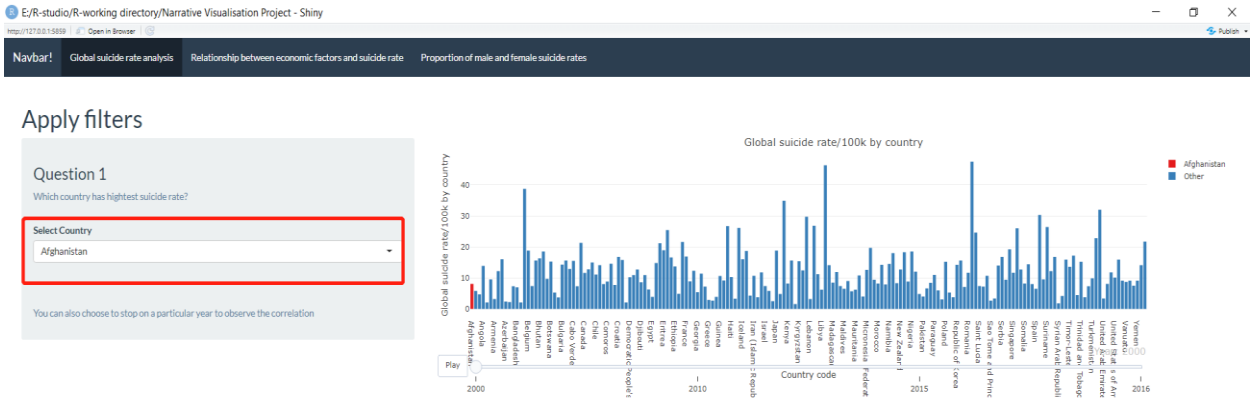


Figure 6 select specific country

6. When the mouse is moved to a specific bar data of the bar chart, the country name and suicide rate of the country will be displayed(Figure 7).

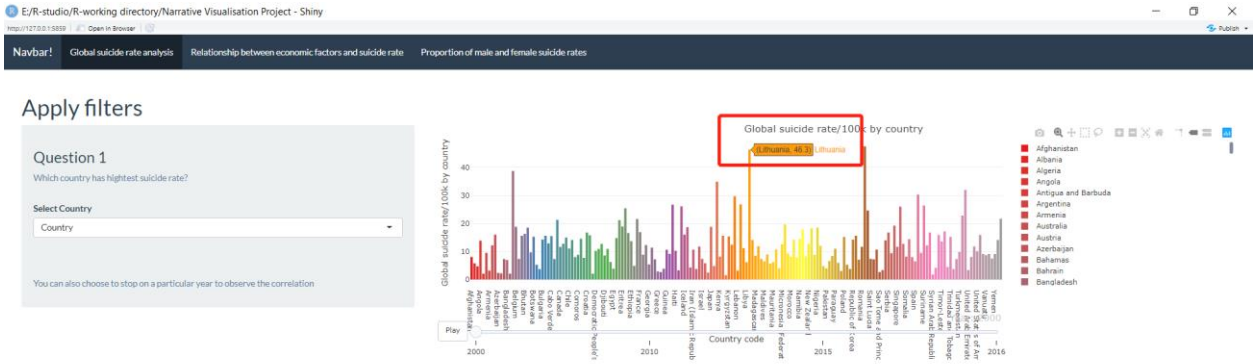


Figure 7 show the detailed infomation

7. The year can be selected at the bottom of the bar chart. You can click the "Play" button, the year will jump sequentially from 2000, 2010, 2015, 2016, or you can directly click or drag to select the year (Figure 8).

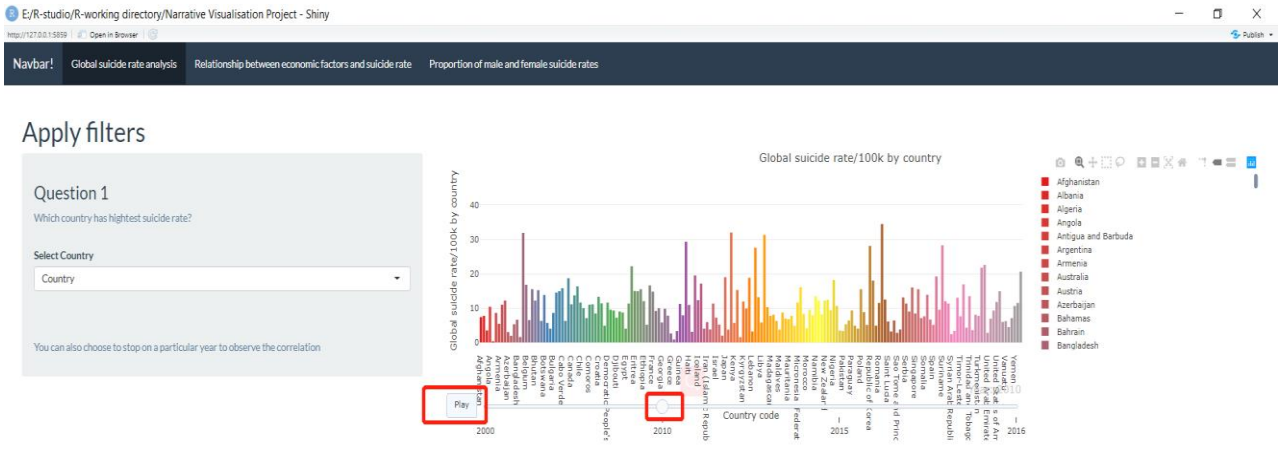


Figure 8 select year

8. Click "Relationship between economic factors and suicide rate" in the navigation bar, and you will enter the second page. This page solves problem 2 "Whether economic changes have an impact on suicide rates"(Figure 9).

Figure 9 Relationship between economic factors and suicide rate

9. The page layout is roughly the same as the first page. The left side is the filter bar, you can select the country, and the right side is a scatter plot graph, which shows "Plot of Yearly Suicide Rate and GDP per Capital". Its Y-axis is "Global suicides (2000) per 100k", the X-axis shows "GDP per capital". The right end will display the names of all countries, arranged in the order of A to Z. The country box has a slide bar and can slide by itself. By default, the graph will display the suicide rate and GDP data of all countries in 2000. The data of each country will be represented by different colored plots, and the size of the data will be represented by the radius of the plot (Figure 9).

Figure 10 layout of page2

10. When the mouse slides to a specific plot of the scatter plot graph, the GDP, suicide rate, and country name of the data will be displayed (Figure 11).

Figure 11 show the detailed infomation

11. The year can be selected at the bottom of the scatter plot graph. You can click the "Play" button, the year will jump sequentially from 2000, 2010, 2015, 2016, or you can directly click or drag to select the year(Figure 12).

Figure 12 show the detailed infomation

12. Click "Proportion of male and female suicide rate" in the navigation bar, and you will be taken to the third page. This page solves problem 3 "Whether different gender has an impact on suicide rates"(Figure 13).

Figure 13 Navigation bar

13. The page has two graphs, a pie chart on the left and a scatter plot graph on the right. The pie chart shows the percentage of gender in the overall suicide rate. The name is "Suicide rate of different gender", the blue part is male, and the orange part is female(Figure 14).

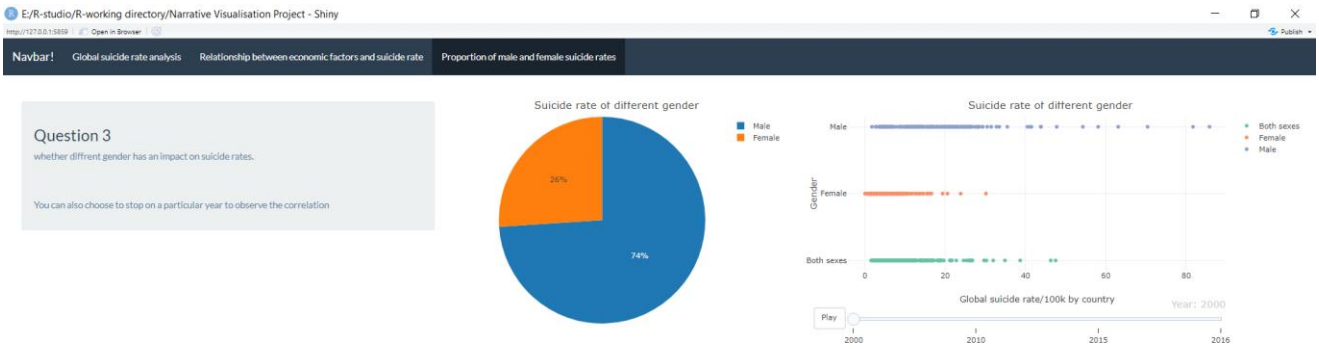


Figure 14 layout of page3

14. When the mouse slides over a specific pie chart data, the data name and suicide rate will be displayed(Figure 15).

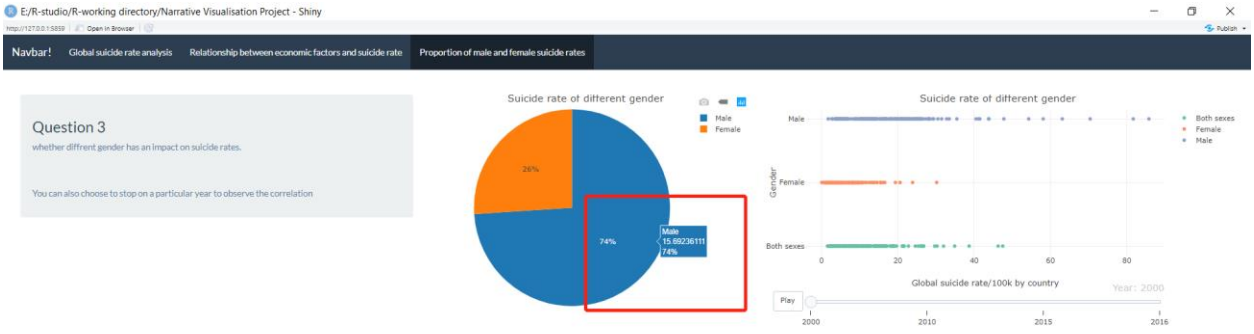


Figure 15 show the detailed infomation

15. The scatter plot on the right is talking about “Suicide rate of different gender”. The difference with the pie chart is that the graph shows the proportion of gender in different countries in different years, including the number and intensity(Figure 16).

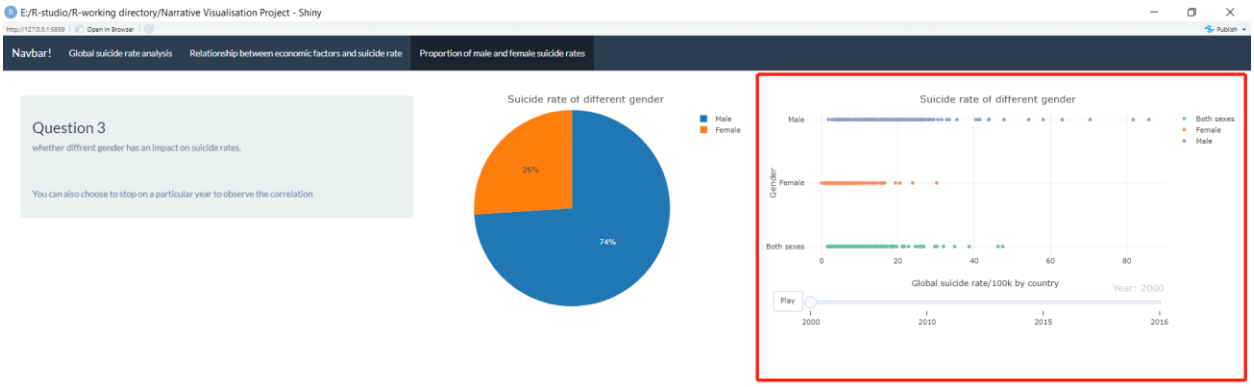


Figure 16 sctter plot

16. When the mouse slides to a specific plot data of the scatter plot graph, the proportion and gender of the data will be displayed(Figure 17).

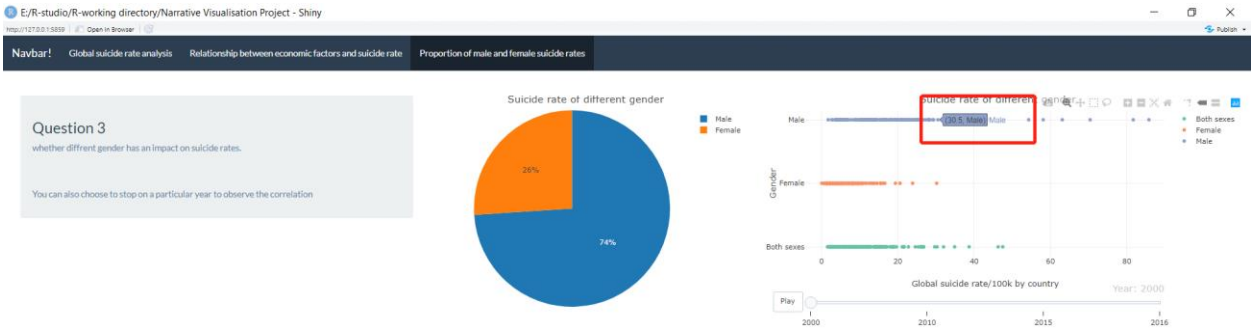


Figure 17 show the detailed infomation

17. The year can be selected at the bottom of the scatter plot graph. You can click the "Play" button, the year will jump sequentially from 2000, 2010, 2015, 2016, or you can directly click or drag to select the year.

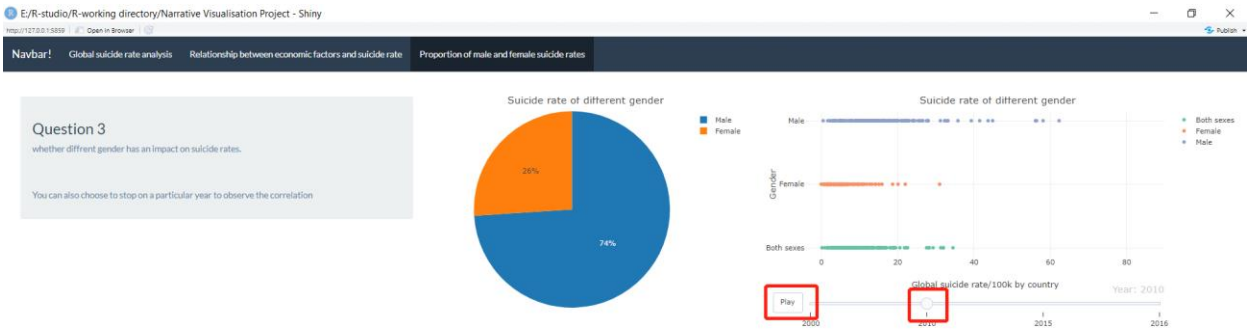


Figure 18 select year

5.Conclusion

This project explores the relationship between suicide rates, gender and economic factors in different countries around the world.Users can explore these three issues through the web page. Use the navigation title bar to display the three questions separately, and each plot has interactive functions. The user can select the country or year he is interested in observing the changes in the picture. In this project, I learned how to analyze the data and display the data with appropriate types of graphs.

In the implementation process, I found that plotly is a very practical package, which can help me quickly achieve interactive images. For the improvement of this project, I think that I should add latitude and longitude to the data, and display the data by using a map so that you can more intuitively see the distribution of suicide rates around the world. At the same time, I can add information about the continent of each country, such as Asia, North America, etc., to explore the suicide rate of different continents. It can be analyzed whether the suicide rate is related to humanities.

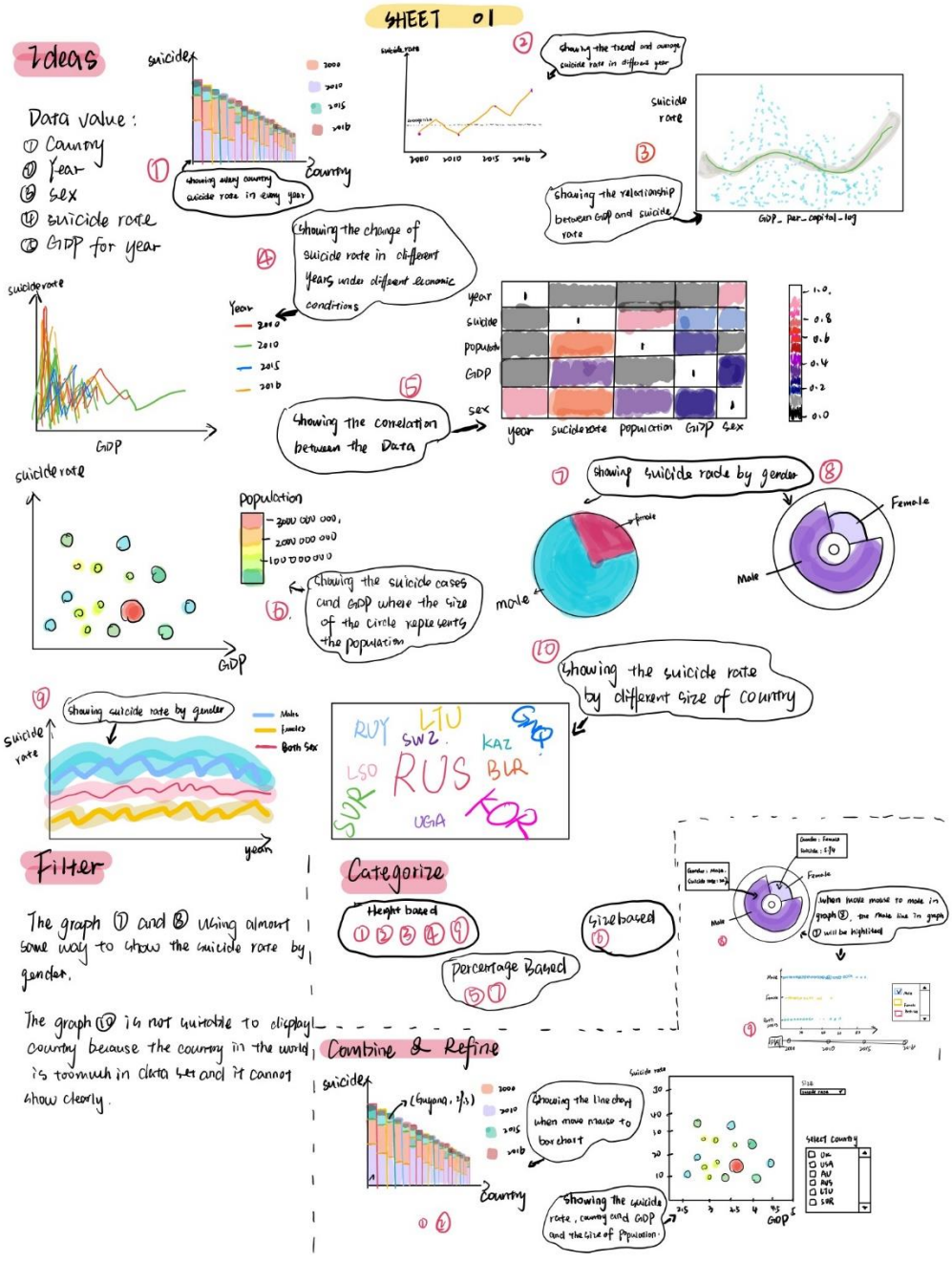
Bibliography

Chang, Winston. 2017. “Interactive Plots (in Shiny).”
Blog. http://shiny.rstudio.com/articles/plot-interaction.html.

Tabular data 1: 1K rows x 6 columns. suicide rate of each gender in countries around the world in 2000, 2010, 2015 and 2016.(https://apps.who.int/gho/data/view.main.MHSUICIDEv)

Tabular data 2: 1K rows x 63 columns. GDP of global countries from 1960-2018
(https://data.worldbank.org/indicator/NY.GDP.MKTP.CD)

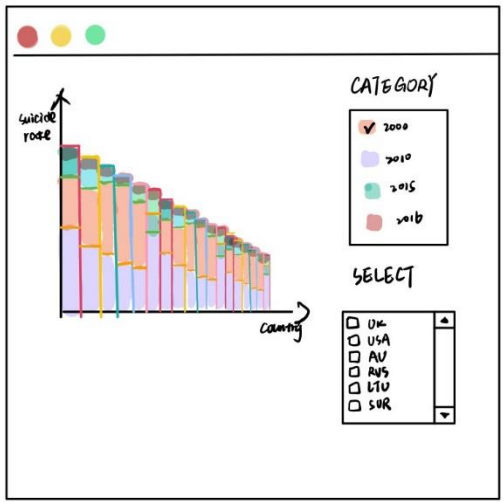
Appendix


SHEET 01
Ideas
Data value :
① Country
② Year
③ Sex
④ suicide rate
⑤ GDP for year
Filter
The graph ① and ② using almost same way to show the suicide rate by gender.
The graph ⑩ is not suitable to display country because the country in the world is toomuch in data set and it cannot show clearly.
Categorize
Height based
Size based
Percentage Based
Combine & Refine

SHEET 02

Title	Relationship between global suicide rates and GDP
Author	Yi Xu
Date	01/06/2020
SHEET	02
TASK	Global suicide rate by country and year

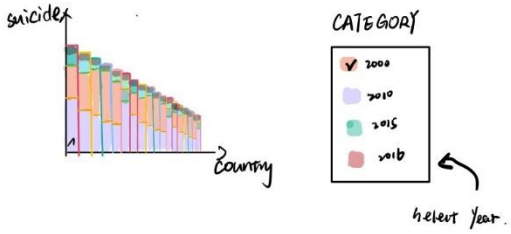
Lay Out



Operation

- User can select Year and the bar chart will show the specific year of suicide rate
- User can move mouse to each bar. It will show the line chart to represent the trend of suicide rate
- User can choose different country.

FOCUS



SELECT

← Click the country to show the suicide rate and other countries color will change grey.

Discussion

Advantage

① Users can see the trend of suicide rate of each country in different years through the line chart.

② Users can intuitively see which country in the world has the highest rate

③ Users can choose a specific year to see the suicide rate

④ Users can choose the country that they want.

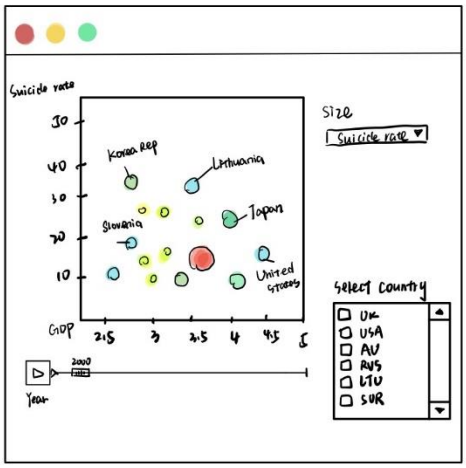
Drawbacks.

① The histogram is not clear enough for each country in different year. The user can not intuitively understand it.

SHEET 03

Title	Relationship between global suicide rates and GDP
Author	Yi Xu
Date	01/06/2020
SHEET	03
TASK	Relationship between economic factors and suicide rate

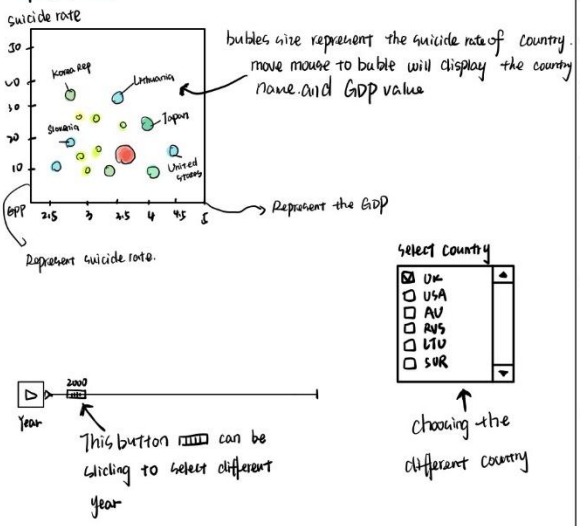
Layout



Operation

- Users can move the mouse to the bubles the graph will show the name of the country
- Users can slicle button to select different years, and the graph will show the suicide cases and GDP specific year.
- Users can select different country in select box.
- Users can select population value in population box.

Focus



Discussion

Advantage

① This graph will clearly show the relationship between suicide rate, GDP and population rate.

② Users can choose more interactive options to realize the relationship between different element.

Disadvantage

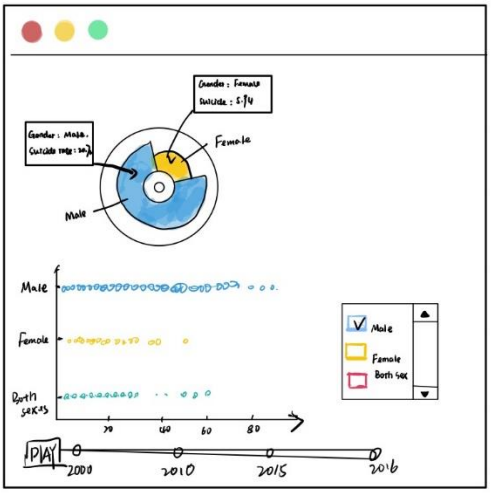
① The relationship between GDP and suicide rate cannot be seen intuitively in different years.

② Hard to implement.

SHEET 04

Title	Relationship between global suicide rates and GDP
Author	Yi Xu
Date	01/06/2020
SHEET	04
TASK	Proportion of male and female rates

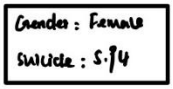
Layout



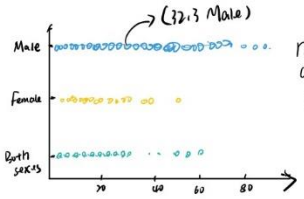
Operation

- User move mouse to pie chart, it will show the suicide rate value.
- User can move mouse to line chart, it will show the year and suicide rate value.
- User can select specific gender in line chart.

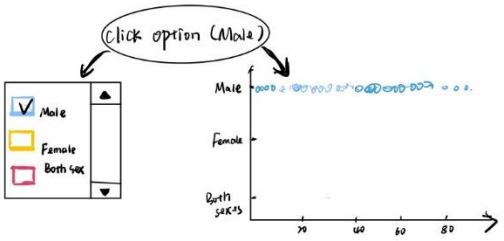
Focus



move the mouse to pie chart. it will show the information include gender and suicide rate.



move mouse to the line it will show detail information about suicide



Discussion

Advantage:

① This graph can show the detail information when user interacts with it.

② Simple design to help user understand the trend of suicide rate by different gender.

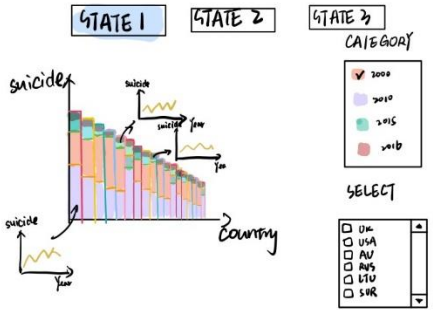
Disadvantage:

① There is no interaction between these two pictures.

SHEET 05

Title	Relationship between global suicide rates and GDP
Author	Yi Xu
Date	01/06/2020
SHEET	04

STATE 1 STATE 2 STATE 3

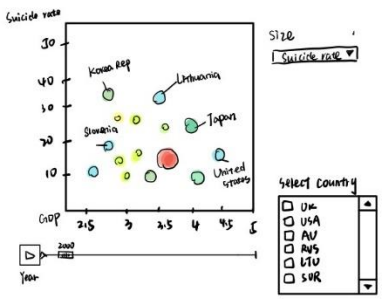


Operation

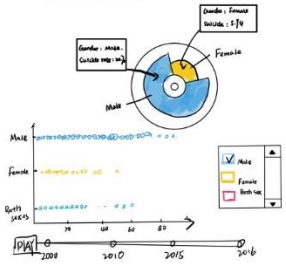
People can click "State 1", "State 2" "State 3" in the website and choose to see the graph.

Each graph will has interactive function and the graph will show differently when people select opeion in the select box.

STATE 1 STATE 2 STATE 3



STATE 1 STATE 2 STATE 3



Detail

Tools : Use R (shinnys) to achieve it.

Method : bar chart, line chart. motion chart, pie chart.

Time : It will take me about 3 days to implement the graph.

limitation:
Missing interactive function between graphs

LAYOUT FOCUS